

National Ecodyn Survey

Summary

The survey was commissioned to cover a representative sample of approximately 1000 km of roads throughout England and Scotland measuring the retro-reflectivity of road markings. The minimum specifiable level for retro-reflectivity under BSEN 1436 is 100 millicandella and the Road Safety Markings Association believes this to be the minimum safety level under the new European standards, which are based on performance for end-users.

The latest survey detailed in the 'Up to the Mark? 2001' research paper, the third to be undertaken, found that 40% of roads in the UK have road markings that fall below this minimum level. The RSMA believes this to be a great cause for concern and that the safety of road-users is being compromised. As a body dedicated to promoting road safety the RSMA is campaigning to ensure all roads meet the minimum requirements regardless of the application date of the marking.

UP TO THE MARK 2001?

A Road Safety Markings Association Research Paper: Road Markings Performance Levels on UK Roads.

SECTION 1: INTRODUCTION

The RSMA 'Up to the Mark 2001?' Ecodyn Survey is the third national survey commissioned by the Association since 1996, covering a representative sample of approximately 1000km of roads in England and Scotland and represents what we believe to be the most accurate survey to date in measuring the retro-reflectivity performance of UK road markings.

The 2001 survey is the first to be undertaken since the introduction of European Standards for road marking materials and more importantly the introduction of the concept of end user performance levels with the implementation of BSEN 1436:Road Marking Materials Performance for Road Users.

The last Ecodyn Survey (1998) reported in the RSMA publication 'Up to the Mark?' raised grave concerns regarding the level of investment in the UK road marking network as it recorded performance levels for road markings substantially below the minimum specified level for retro-reflectivity identified in BSEN 1436, with a staggering 49% of all markings falling below what the industry recognises to be the minimum safety level.

The 1998 report also identified a number of actions that RSMA felt would help address the problem, many of which are still to be undertaken; these are detailed later

in this document along with a commentary on what (if any) progress has been made in implementation.

All three of the surveys so far undertaken have been done so using Ecodyn equipment operated at the equipment geometry prevailing and accepted at the time of the survey, consequently this latest survey has been undertaken using the 30m geometry specified within the relevant European Standards, whilst previous surveys have used the 15m geometry accepted at that time.

The net effect of this new geometry may to be produce slightly poorer results than that recorded under previous surveys, however, the new geometry has been introduced in order to more clearly stimulate the experience of drivers and therefore provides a far more accurate representation of what is actually happening on our roads and than has hitherto been possible.

SECTION 1: AT A GLANCE

- UP TO THE MARK 2001? is the third RSMA Ecodyn Survey of a consistent 1000 km circuit of UK roads.
- Previous reports have indicated that a lack of investment had led to nearly half of all in situ markings performing below the minimum specified level of retro-reflectivity indicated in new standards.
- Many of the recommendations from previous surveys have yet to be actioned by the responsible authorities.
- This years survey is the first since the introduction of new European standards and utilises the new 30 m geometry for the first time, making it the most relevant survey to date.

SECTION 2: EXECUTIVE SUMMARY

The 2001 survey identifies an unacceptably high failure rate on all categories of roads included in the sample with a weighted average of 40% of all markings below the 100mcd/m²lx threshold.

In addition to these failure rates the profile of markings generally indicated that the medium term performance of the surveyed road is likely to be poorer still with high levels of markings below 150mcd/m²lx combined with relatively low average retro-reflectivity levels on the roads in the sample.

The RSMA believes that the lowest retro-reflectivity level specifiable in BSEN1436, the road marking standard for road users (100mcd/m²lx) represents the effective safety minimum for markings and in this context our findings show the following:

Motorways:	39% of markings below minimum safety levels
A Roads (Dual Carriageways):	38% of markings below minimum safety levels
A Roads (Single Carriageway):	44% of markings bellow minimum safety levels

No detailed analysis was undertaken in 2001 for B roads because of the small sample size available.

The omission of B roads from the 2001 analysis and a change in the geometry of the Ecodyn equipment to that required by the new European standards means that a direct comparison with the 1998 figures is not possible.

Notwithstanding the fact that a direct comparison cannot be made, the survey clearly indicates that urgent action is needed to remedy what is an on-going failure in the UK marking infrastructure and that all responsible authorities both national and local need to review their position and take prompt and appropriate action.

The overall failure rate of 40% indicates that despite the alleged commitment of resources to improving highways infrastructure, the marking regime is still not receiving the level of investment required to ensure that the only continuous message system and primary road safety mechanism is operating at even the most basic level required for road users.

In the conclusions to the 1998 survey, the RSMA recommended a range of actions were implemented in order to improve safety for road users on UK roads, in respect to road markings.

These recommendations and actions to date are shown below:

- 1998 Immediate and urgent investment required to bring the markings on UK roads up to minimum safety levels.
- 2001 40% of road markings still below minimum safety levels that can be specified under the relevant European standards for road users. Volumes of road marking materials supplied within the UK has declined since 1998, thereby indicating that required investment has not taken place.
- 1998 A schedule of programmed performance measurement and maintenance is required
- 2001 There is no evidence to suggest that any schedule of programmes performance measurement has been established and there is no clear indication that any maintenance schedule has been drawn up.
- 1998 Specialised specification criteria need to be drawn up for markings on UK roads.
- 2001 In May 2001 the updated Specification for Highways Works introduced new specification criteria for new road markings on Highway Agency roads. This followed and largely mirrors details published in the RSMA StanSpec publication. However, of greater significance is the fact that there is still no valid maintenance standard/guidelines in existence for in situ and existing road markings, as the previous TD26/86 document is no longer valid citing as it does withdrawn British Standards.

1998 All responsible authorities should develop and implement a plan to improve safety on UK roads.

2001 Both Central and Local Government have started to develop clearer road safety strategies, although these strategies have largely failed to acknowledge the importance of road marking performance in road safety.

The outcome of the 2001 survey serves to outline the importance of our 1998 recommendations and it is with a high level of concern that we again present these recommendations to responsible authorities for urgent action, as nearly half of all UK road markings remain below the minimum safety level specified for road users in BS 1436.

The RSMA is concerned that not enough has been done to address the problems highlighted despite the provision of evidence (Best Value – A Marked Sign of Improvement RSMA/ARTSM 2000) that road markings both save lives and provide a ‘Best Value’ approach within the definition of the governments policy to provide more integrated, cost effective and responsive public services. Decisive action is long overdue.

SECTION 2: AT A GLANCE

- 39% of motorway road markings below minimum specifiable retro-reflective safety level in BS 1436
- 38% of dual carriageway road markings below minimum specifiable retro-reflective safety level in BSEN 1436.
- 44% of single carriageway A roads below minimum retro-reflective specifiable safety level in BSEN 1436.
- A weighted average of 40% of all road markings are below the minimum specifiable safety level of 100mcd/m²lx called up in BSEN 1436 – the road marking standard for road users.
- No substantial progress has been made in implementing the recommendations of the original 1998 ‘Up to the Mark?’ report, despite the then clearly identified deficiencies in the UK road marking network.
- The capacity for road markings to provide a ‘Best Value’ solution for Central and Local Government and other Public Agencies is still not being adequately addressed. (See RSMA/ARTSM Report – Best Value: A Marked Sign of Improvement.)

SECTION 3: METHODOLOGY

Ecodyn

The survey was undertaken using an Ecodyn machine operated by Prismo Contracting Services Ltd and commissioned by the Road Safety Markings Association.

The equipment operates at the 30 m geometry in line with the requirements specified in the relevant European standards operating in the UK.

The Ecodyn equipment used is currently the only equipment available in the UK capable of undertaking a mobile measurement of retro-reflectivity and has been used by a number of local authorities to audit their 'stock'.

Measurement

Where reference is made to road markings or markings throughout this report they should be taken to represent the following road markings as measured:

Motorways –

Markings delineating lanes on motorways as indicated on the individual road report in Appendix A.

Dual Carriageways –

Markings delineating the two lanes on the dual carriageway as indicated on the individual road report in Appendix A.

A Roads (Single Carriageway) –

Markings delineating the two lanes as indicated on the individual road report in Appendix A.

The test circuit comprised 999 km of roads, identified in Appendix A, comprising a mix of motorways, dual carriageways, A roads and B roads. Of those roads on the test circuit the B roads have been omitted from the analysis as a result of poor weather conditions rendering the number of retro-reflective performance obtained on them is included in Appendix A.

Due to the changes in geometry identified in Sections 1 and 2, no direct comparison has been made between results obtained in previous surveys and the 2001 survey.

On the basis of the above and the removal of B roads from the analysis, the results obtained are based on a total of 945.1 km of roads broken down as follows:

Motorway:	352.3 km
Dual Carriageways:	270.6 km
A Roads:	<u>322.2 km</u>
Total:	945.1 km

SECTION 3: AT A GLANCE

- Survey undertaken using Ecodyn mobile measuring equipment.

- Measurement of lane lines and centre lines across a range of motorways, dual carriageways and single carriageway A roads.
- Category B roads measured but omitted from the 2001 survey analysis.
- Direct comparison between 2001 results and previous not undertaken because of measuring geometry changes.
- A total of 945.1 km of roads measured and analysed.

SECTION 4: PREVIOUS SURVEYS

Whilst no comparison between previous surveys and the 2001 survey is statistically valid because of the absence of a consistent correlation between the two different geometries utilised, the results of previous surveys are reproduced here in figure 4.1 in order to show the historical background to the 2001 survey.

Type of road	Km surveyed	1996 %age of lines < 100mcd/m ² lx	1998 %age of lines <100mcd/m ² lx
MOTORWAY	323.4	24	51
A ROADS	599.8	30	46
B ROADS	42.4	53	70
ALL ROADS Weighted Average	965.8	29	49

As can be seen above the previous surveys indicated a substantial decline in the performance of road markings on UK roads between 1996 and 1998, with nearly half of all UK road markings below the 100mcd/m²lx threshold, resulting in the recommendations put forward by the RSMA and outlined in Section 2 of this paper.

SECTION 4: AT A GLANCE

- The 1996 and 1998 surveys showed a significantly deteriorating position regarding the performance levels of road markings on UK roads, with nearly half of all markings registering below the 100mcd/m²lx threshold in the road user standard BSEN 1436.
- RSMA made a series of recommendations to address what was seen as major road safety issues arising out of this deterioration (see section 2).

SECTION 5: THE 2001 SURVEY RESULTS

As indicated above the 2001 survey covered a total of 945 km of UK roads, broken down in the proportions as indicated in Figure 5.1.

Type of road	Km surveyed	2001 % of lines < 100mcd/m ² lx	2001 % of lines < 150mcd/m ² lx
MOTOWAY	352.3	39	88
DUAL A ROADS	270.6	38	78

SINGLE A ROADS	322.2	44	88
ALL ROADS WEIGHTED AVERAGE	945.1	40	85

Figure 5.1

This diagram identifies the proportion of markings falling below 100mcd/m²lx for each road category, with the total representing a weighted average of all markings in all categories that fall below the 100mcd/m²lx threshold along with an additional analysis for markings below 150mcd/m²lx. This latter analysis has been undertaken as a marker for future surveys for two reasons:

- a. In anticipation of the new 150mcd/m²lx class being introduced into relevant European standards when they are next revised.
- b. To provide baseline information for future analysis on specification of performance materials and/or an indication of enhancement in marking infrastructure.

Whilst detailed commentary on markings recorded at below 150mcd/m²lx is not provided within this paper, such data is used to estimate potential future performance of markings on roads causing concern and will also form part of the baseline data for the next Ecodyn survey to be undertaken in 2002.

The main results analysed in this survey, namely of those markings that fall below 100mcd/m²lx indicate that there remains a significant problem with the UK road marking network across motorways, dual carriageways and principal A roads.

With a total of 40% of all markings measuring below the minimum level that can be specified in BSEN 1436, which is the only standard that measures the performance of road markings for the driver/road user, then clear concern has to be expressed and the urgency of immediate action cannot be overstated.

Detailed in Figure 5.2 to Figure 5.4 below are the results broken down by road type and by individual road, thereby providing a clear indication as to where the main areas of concern appear to be.

Road surveyed	Km surveyed	% lines below 100mcd/m ² lx	% lines below 150mcd/m ² lx	Average retro-reflectivity
M40	72.0	55	90	104
M69	25.5	68	100	92
M62	31.7	13	78	129
M1	97.4	52	95	102
M66	16.0	19	93	116
M6	109.7	24	74	141

Figure 5.2

The results obtained from the motorway sample clearly illustrate the urgency for a clearer defined programme of maintenance on our motorway network. Whilst three motorways have recorded better than average results in respect to the 100mcd/m²lx

threshold, (M6, M62 & M66) indications are that these could in the medium term become a cause for concern similar to those other motorways that have been monitored as a result of the high percentage of markings on the <150mcd/m²lx category.

The survey results for the M69 indicate that urgent remedial action is required to bring the markings up to what the RSMA believe to be a safe level for the road user. The fact that the 1998 results for the M69 recorded marginally higher failure rates (74%) than those highlighted in the 2001 survey (68%) would also suggest, notwithstanding the change in geometry, that a reappraisal of either the specification or frequency of maintenance needs to be undertaken as a matter of urgency.

The > 100mcd/m²lx average readings attained do not compensate for the high failure rate since performance minimums are relevant to immediate sight lines and not over tens of kilometres.

The fact that 39% of the markings in the motorway sample fall below the 100mcd/m²lx threshold is a major cause for concern considering the volumes of traffic using the motorway network. Urgent action is required by the highways agency to establish a relevant maintenance standard and regime, in line with the recommendations from the 1998 Up to the Mark report.

The results for the dual carriageway sample provide similar levels of concern with some 38% of the markings sampled falling below the minimum threshold. Figure 5.3 provides the detailed breakdown of the results obtained from the Dual Carriageway sample.

Road surveyed	Km surveyed	% lines below 100mcd/m ² lx	% lines below 150mcd/m ² lx	Average retro-reflectivity
A45	24.8	70	99	91
A46	7.2	58	100	98
A56	13.7	73	99	91
A66	80.7	7	45	168
A1	79.4	22	74	129
A75	34.0	7	37	167
A303	30.8	28	89	117

Figure 5.3

Two roads within the sample (A66 and A75) provide excellent results with only 7% of their markings falling below the threshold level and less than 50% below the 150mcd/m²lx level, indicating that the markings on these routes should provide reasonable performance over the medium term. Of these routes the A75 shows consistently good performance since the initial survey in 1996, recording the best average performance over the three surveys across the two different measurement geometries.

Of the remaining dual carriageways, performance can be best described as poor and at worst abysmal. Whilst performance of 22% and 28% failure rates represent generally poor levels of retro-reflectivity for road users the A45, A46 and A56 samples raise great cause for concern. This is especially the case when the high percentage of

markings below the minimum threshold is compounded by the high percentage of markings that are also $< 150\text{mcd/m}^2\text{lx}$ and the relatively low average retro-reflectivity in each sample, indicating that the remaining markings that were $> 100\text{mcd/m}^2\text{lx}$ are likely to have a poor short to medium term performance profile. The responsible authorities should undertake urgent investigations on these routes to determine the level of maintenance required.

The overall poor performance levels in the dual carriageway sample represent a level nearly as poor as that identified in the motorway sample. There are clear indications that many of the heaviest trafficked sections of the dual carriageway network are not receiving regular enough maintenance in order to sustain the level of retro-reflectivity at the minimum level specifiable under BSEN 1436. The case for immediate action by specifying authorities is plainly made.

The sample for single carriageway A roads provides the poorest results in the 2001 survey, in a set of results that are already a cause for concern. Figure 5.4 provides the breakdown of the 322.2 km of single carriageway A roads sampled.

As identified below the single carriageway sample provides the poorest part of the sample in the 2001 survey with some 44% of markings falling below the $100\text{mcd/m}^2\text{lx}$ threshold.

Road surveyed	Km surveyed	% lines below $100\text{mcd/m}^2\text{lx}$	% lines below $150\text{mcd/m}^2\text{lx}$	Average retro-reflectivity
A7	53.5	21	62	141
A59	18.6	43	99	104
A68	25.5	28	79	122
A161	46.2	44	87	111
A352	18.6	56	91	104
A356	23.2	57	93	103
A358	14.1	53	91	104
A359	24.9	38	97	106
A361	23.6	39	80	120
A373	16.8	53	91	105
A629	41.2	63	97	97
A709	16.0	36	92	111

Figure 5.4

As can be seen from Figure 5.4 this is as a result of mediocre performance across the roads sampled with virtually all routes registering very poor results.

This may be as a result of poor specifying by responsible authorities and may further indicate that many of these routes have yet to have maintenance specified to the new European standards.

The overall poor performance of all of the roads in this category also highlights the importance of specifying authorities quickly identifying their responsibilities to drivers under the new standards and to specify and monitor their road markings accordingly. The high levels of markings identified as $< 150\text{mcd/m}^2\text{lx}$ and relatively

low average retro-reflectivity levels indicate that many of these roads will require remarking in the immediate future.

SECTION 5: AT A GLANCE:

- 39% failure rate for motorways highlights the urgent need for a relevant maintenance standard from the Highways Agency. Likely medium term performance is also a cause for concern.
- Whilst a low level of dual carriageway have high levels of conformity to the road user standard, the majority provide major cause for concern with poor performance in both relevant retro-reflectivity categories and unacceptably low average readings.
- Single carriageway A roads provide the poorest performance in the survey and indications are that slow implementation of new standards may be the cause.

SECTION 6: CONCLUSIONS & RECOMMENDATIONS

The results of the 2001 survey are a cause for great concern greater than that generated by the results of the previous survey in 1998 primarily because the new standards have now been introduced and the failure rate remains at an unacceptably high level of 40%.

The majority of our previous recommendations remain unadopted by the relevant authorities. The RSMA are concerned that this general lack of action from responsible authorities could be endangering road users and would urge the Department of Transport, Local Government and the Regions to press the Highways Agency and all other specifying authorities to take immediate action to address the issues raised in this report.

More precisely we recommended the following action as the very minimum:

- a. A Firm timetable is established for the prompt completion of the new TD26 document establishing the maintenance regime for road markings.
- b. A schedule of programmed road marking performance measurement and maintenance should be established, for both Highways Agency and Local Authority roads.
- c. Sufficient investment should be made available to bring retro-reflectivity of UK road markings up to the minimum specifiable level under BSEN 1436 (i.e. 100mcd/m²lx), which RSMA believes to be the minimum level of safety for road users.
- d. Action should be taken by Government to advise Highways Agency and Local Authority specifiers of their responsibility to specify road markings to the new European standards and performance for road user requirements. The results of this survey and additional anecdotal evidence indicate clearly that there are specifiers (including elements of the Highways Agency) that are failing to specify to the new requirements.

The seriousness of the situation that is highlighted in this report should not be understated, ignored or simply dismissed. The results obtained using a system

recognised as having a high level of integrity should be of great concern to all involved in road safety.

With an ageing driver population and the findings of publicly funded research such as COST 331 indicating the need for improved road marking performance for older drivers, our findings have longer term repercussions and not just the shorter term urgent requirements to bring the network up to standard in the short term.

The recently published government document “Transport Statistics in Great Britain 2001”, confirms that motorway accidents have risen by 40% since 1990, thereby underlining the need for action.

We would urge public authorities to respond positively and promptly to our findings. In order to measure any such response we will review the frequency of our survey, with the intention that it should be undertaken annually.

UP TO THE MARK 1998?

THE REPORT OF THE RSMA SURVEY OF ROAD MARKING PERFORMANCE LEVELS ON UK ROADS

INTRODUCTION

The RSMA Ecodyn Survey of UK roads is the second such survey, covering a representative sample of approximately 1000km of roads in England and Scotland. The first survey was undertaken in 1996, whilst the second analysis was completed in 1998.

Both the 1996 and 1998 surveys were commissioned by the Road Safety Markings Association in order to determine the performance of road markings against the broadly accepted minimum performance level of 100 mcd/m²lx. This retro-reflectivity level is also the set minimum standard designated within the new European Standards for road marking due to be introduced in the UK on January 1st 2000.

As the basic level 100 mcd/m²lx takes account of both night-time and wet weather visibility in basic conditions only – there may be conditions where safety would require that a much higher performance would be desirable and/or necessary.

The impetus for the survey was to identify the level of road marking that fell below this minimum and to see whether industry perceived under-investment in road markings by responsible authorities, in the period between 1996 and 1998, was having appreciable impacts upon the road network and consequently on the safety of roads for the road user.

The surveys were undertaken using Ecodyn equipment operated by Prismo Ltd to a geometry that is accepted throughout Europe and would if anything provide higher

reading in terms of retro-reflectivity than would be the case with the geometry specified within the forthcoming European Standards.

SUMMARY OF FINDINGS AND CONCLUSIONS

Findings

The survey undertaken in 1998 identified a dramatic reduction in the performance levels of road markings on major UK roads since 1996.

This reduction in performance meant that across all roads on the test circuit 49% of markings failed to meet the minimum criteria for retro-reflectivity performance in comparison of 29% two years ago.

This figure was broken down across road types and this identified major declines in the performance levels of markings on

- i.) Motorways – 51% below minimum safety levels in 1998 compared with 24% in 1996.
- ii.) Major A Roads (Dual Carriageways) – 54% below minimum safety levels in 1998 compared with 24% in 1996

All categories of roads had a decline in performance between 1996 and 1998 underlining the generally inadequate levels of investment in the most basic of road safety features.

Under funding of minor roads may be exposing road users to added dangers with up to 70% of lines failing to achieve minimum standards.

Improvements in performance levels were recorded where investment in infrastructure was taking place – making roads safer for all road users.

Conclusions

Based on previous RSMA research it is clear that under funding of basic road safety features such as markings, places an extra burden on the economy and public expenditure (including the NHS¹).

Urgent Government action is required in the following areas:

Immediate and urgent investment is required to bring markings on UK roads up to minimum safety levels.

A schedule of programmed performance measurement and maintenance is required.

Specialised specification criteria need to be drawn up for marking on UK roads.

All responsible authorities (Central and Local Government) should develop and implement a plan to improve safety on UK roads.

METHODOLOGY

Ecodyn

Both surveys (1996 and 1998) were undertaken using an Ecodyn machine operated by Prismo Ltd. This machine operates a geometry accepted throughout Europe, although at a lower level than that designated under the new European Standards and that generally specified by responsible authorities in the UK.

The effect of this change in geometry is that the readings outlined in this report are marginally higher than those that would be obtained using conventional hand held equipment that is used by contractors to measure performance. Ironically this geometry will consequently tend to show markings as having a higher performance level than that used to judge performance levels in a contractual situation.

Ecodyn equipment is the only equipment currently available in the UK that would allow the form of surveying undertaken in this study.

Measurement

Where reference is made to markings throughout this report they should be taken to represent the following road markings as measured:

- Motorways - Markings delineating lanes on motorways.
- Dual Carriageways - Markings delineating the two lanes on the dual carriageway.
- A Roads and B Roads
Single Carriageway - Centre line markings delineating the two lanes.

THE PREVIOUS SURVEY – 1996

The survey undertaken in 1996 covered 1055 km of UK highways across 33 designated roads, of this only 965.8 km is used for comparison purpose with the 1998 study. Inclement weather made it impossible to undertake detailed surveying of two road sections surveyed in 1996, whilst excess moisture on the lines, dirty areas and major works rendered random areas of road incomparable between the new surveys. The effect of these omissions is deemed to be neutral.

The 1996 survey indicated that some 28% (weighted average) of the markings surveyed fell below the 'minimum' standard of 100 mcd/m²lx, this failure rate was broken down across the various road categories as indicated in Figure 1.

Figure 1 – 1996 Basic Data

Type of Road	Km Surveyed	% of Markings < 100 mcd/m ² lx
Motorways	373.2	22
A Roads	629.1	30
B Roads	52.7	51

ALL ROADS	1055	28
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Whilst just less than one third of lines failed the test, the average reading for all lines was a relatively healthy 125.5 mcd/m²lx. This average should not be read as compensating for the 28 % failure level since performance minimums are relevant to immediate sight lines and not over 1000 km of roads. The average retro-reflectivity level does however provide a useful level from which to assess relative line performance over the period of the two surveys.

Consequently the 1996 survey and its findings are used as the base line for comparing the relative performance of markings in the 1998 study and the possible implications that the 1998 results may have for road safety.

THE LATEST SURVEY – 1998

As outlined above, the 1998 survey sought to cover the same roads as those surveyed in 1996 and 92% coverage of the previous survey was obtained.

The findings of the 1998 survey are shown with comparative figures derived from the 1996 report, where the 1996 figures have been re-profiled as to allow accurate comparisons with the latest data.

Figure 2 shows the failure rate of lines, again across road type along with the weighted average for failure of all lines.

Figure 2 – Revised 1996 Data and 1998 Basic Data

Type of Road	Km Surveyed	1996 % of lines < 100 mcd/m ² lx	1998 % of lines < 100 mcd/m ² lx
Motorways	323.4	24	51
A Roads	599.8	30	46
B Roads	42.4	53	70
ALL ROADS	965.8	29	49

These results indicate a marked deterioration in the performance of road markings in the time period between the two surveys being undertaken. This deterioration is at its most marked on motorway sections, although the results on 'A' roads are a cause for major concern due to the volume of traffic using these roads.

A more detailed breakdown analysis of the above grouped data has also been undertaken and is detailed below, the categories being used for analysis being:

Motorways, A Roads – Dual Carriageways, A Roads Single Carriageway, B Roads and Minor A Roads.

The results of this analysis are detailed in Figures 3 to 6 and show the change in the average retro-reflectivity reading on each stretch of road monitored along with any changes in the percentage of markings that fall below the accepted minimum standard of 100 mcd/m²lx. Where a stretch of road has not been re-analysed in the 1998

survey, those readings attained in the original 1996 survey are shown without comparison.

ANALYSIS BY CLASS OF ROAD

The breakdown analysis of the performance levels of markings in Motorways (Figure 3) shows a substantial decline in the performance level on the M1 and M69 and that all sections of motorway analysed with the exception of the M62 showed a decline in performance levels. Indeed across all Motorways – 51% of markings were below minimum safety levels in 1998 compared with 24% in 1996.

Figure 3 - Motorways

Motorway Surveyed	Average retro-reflectivity reading 1996 mcd/m ² lx	Average retro-reflectivity reading 1998 mcd/m ² lx	Percentage change in retro-reflectivity level '96 to '98	Percentage of lines below mcd/m ² lx 1996	Percentage of lines below mcd/m ² lx 1998	Kilometres Surveyed
M40	213	140	-34	4	31	68.3
M69	138	95	-31	10	74	23.8
M62	134	-	-	25	-	22.9
M1	145	103	-29	15	57	89.1
M62	102	130	+27	44	39	30.8
M66	129	115	-11	27	44	13.2
M6	128	100	-22	41	58	98.2

The breakdown analysis of the performance levels of markings on Dual Carriageways (Figure 4) indicates a substantial fall in performance levels with the percentage of lines below the performance minimum more than doubling from 24% in 1996 to 54% in 1998.

Figure 4 – A Roads (Dual Carriageway)

Road Surveyed	Average retro-reflectivity reading 1996 mcd/m ² lx	Average retro-reflectivity reading 1998 mcd/m ² lx	Percentage change in retro-reflectivity level '96 to '98	Percentage of lines below mcd/m ² lx 1996	Percentage of lines below mcd/m ² lx 1998	Kilometres Surveyed
A45	123	100	-19	16.8	67	25.7
A46	106	86	-19	28	87	6.8
A56	99	110	+11	43	57	13.3
A66	137	111	-19	24.8	53	77
A1	115	81	-30	42.2	85	69.4
A75	162	198	+22	2	21	30.4
A303	127	137	+7	12	9	27.9

Whilst improvements can be seen on roads where major improvements have or are taking place the overall figures provide major cause for concern in terms of safety for drivers on dual carriageways.

Particular reductions in performance levels on the heavily trafficked A1, A45 and A46 roads indicate a need for additional investment on these trunk routes, whilst improved maintenance scheduling may be required more generally.

Figure 5 shows the breakdown analysis for single carriageway roads and as would be expected following the analysis in figure 4, these results are marginally better than those recorded for the dual carriageway roads. Nevertheless performance levels of markings on the tested stretched of road still show a decline, with 44.5% now below the minimum standard against 34% in 1996.

Figure 5 – A Roads single carriageway

Road Surveyed	Average retro-reflectivity reading 1996 mcd/m ² lx	Average retro-reflectivity reading 1998 mcd/m ² lx	Percentage change in retro-reflectivity level '96 to '98	Percentage of lines below mcd/m ² lx 1996	Percentage of lines below mcd/m ² lx 1998	Kilometres Surveyed
A361	214	136	-36	4	19	22.4
A161	105	94	-10	55	74	36.3
A629	108	115	+6	48.5	63	37.1
A671	123	91	-26	51.5	77	6.9
A59	135	116	-14	10.9	47	18.3
A68	146	130	-11	17	32	24.4
A7	141	128	-9	14	26	51.9
A709	111	119	+7	39.6	21	15.9
A359	120	99	-18	29.3	60	24.3
A358	102	119	+17	52	26	13.6
A373	136	110	-19	56.4	50	15.5
A356	118	116	-2	29.3	33	23.1
A352	115	102	-12	33	50	20.4

The breakdown analysis for single carriageway roads would tend to suggest that maintenance patterns on these roads are more regular and/or lighter trafficking on these routes. However, the results still indicate a deteriorating situation in performance levels and a consequent reduction in the safety of UK roads. Maintenance patterns would benefit from review to ensure that time-scales are as required and that specifications are adequate to traffic needs.

The breakdown analysis on B Roads and Minor A Roads shown as Figure 6 also

Figure 6 – B Roads and Minor A Roads

Road Surveyed	Average retro-reflectivity reading 1996 mcd/m ² lx	Average retro-reflectivity reading 1998 mcd/m ² lx	Percentage change in retro-reflectivity level '96 to '98	Percentage of lines below mcd/m ² lx 1996	Percentage of lines below mcd/m ² lx 1998	Kilometres Surveyed
B1403	106	85	-20	55.4	81	6.3
B7608	99	-	-	53	-	27.6
B3181	143	97	-32	57	71	7.3

Since it is the road markings that provide the clearest and most continuous safety message to all road users, not just drivers but also cyclists and pedestrians, the results of the RSMA survey require an immediate response from the responsible authorities.

The urgency for action in this area is underlined by the imminent introduction of European Performance Standards for road markings on January 1st 2000, when the minimum performance level for a road marking in use shall be set at 100 mcd/m²lx – a performance level that the RSMA survey clearly indicates is being met by barely half of road markings in the UK.

The introduction of European Standards will also bring with it opportunities to ensure that UK roads are more adequately specified for the performance of road markings, equally this opportunity can only be optimised if there is clear understanding of the specification process.

The reality is that large stretches of UK roads are failing to provide the most basic and fundamental safety requirements to users and that this failure may put at risk road users throughout the country, especially at night and in wet driving conditions.

It is clear that the findings of this report raise serious issues that need to be addressed, primarily by Central and Local Government, where they have a responsibility for road maintenance and the safety of road users. We hope that the Government and its maintenance agents will take the lead by adopting the recommendations that have come out this and previous research.

Previous research undertaken by the Road Safety Markings Association and the Association for Road Traffic Safety and Management (*Cosmetic or Crucial RSMA/ATRSM, 1998*) clearly identified the link between accident reduction and improvements in road markings (and signage). Indeed this report also outlined the significant savings such improvements can have for the economy through the reduction in accidents, health care needs and associated costs.

The RSMA recommend that the Government and all authorities responsible for this most fundamental element of road safety adopt the following course of action, which will enhance and underwrite the safety of UK roads.

1. The introduction of a dedicated budget for the measurement of in-situ performance levels of road markings.
2. The development of an adequate maintenance regime for road markings.
3. The development of adequate specification criteria, to ensure that road marking performance criteria is not under specified in relation to current traffic and projected traffic conditions.
4. The urgent investment in maintenance to bring UK roads up to at least minimum standards of safety that drivers have a right to expect.

References,

- 1) Cosmetic or Crucial – The Case for good signing and lining? (Technical Guide), RSMA/ARTSM, 1998
- 2) Traffic in Great Britain Statistical Bulletin 1st, 2nd & 3rd Quarters 1998 - DETR